REMARKS

In view of the following discussion, the applicants submit that none of the claims now pending in the application are anticipated under the provisions of 35 U. S. C. § 102, or obvious under the provisions of 35 U. S. C. § 103. Thus, applicants believe that all of these claims are now in allowable form.

REJECTIONS

A. 35 U. S. C. § 102

1. 1-3 and 9-10 are not anticipated by Campbell et al.

Claims 1-3 and 9-10 stand rejected under 35 U. S. C. § 102 as being unpatentable over Campbell et al. (U. S. Patent 6,230,069 issued May 8, 2001). Applicants submit that these claims are not anticipated by this reference.

Claims 1-3 and 9-10 are directed to a method of controlling manufacturing processes performed on a workpiece (*see*, specification at page 2, paragraph 4, lines 3-6). In particular, claim 1 includes the following steps:

> "A method of monitoring and controlling manufacturing processes within a multi-step manufacturing system having independently operating tools that perform specific processes upon a workpiece, comprising:
>
> testing a workpiece after one or more steps of processing within one or more independently operating tools;
>
> generating control parameters for previous and subsequent processing steps that are performed or have been performed on the workpiece by the independently operating tools;
>
> selectively supplying said control parameters to either the previous processing step or the subsequent processing step, or both to optimize the processing performed upon the workpiece."

In claim 1, a workpiece is tested after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein (*see*, specification at page 4, paragraphs 13-14).

Campbell et al. describes a method of controlling the manufacture of semiconductor wafers using model predictive control (*see*, Campbell et al. at column 1, lines 15-19). In model predictive control, a manufacturing tool output is determined based on a first wafer run (*see*, Campbell et al. at column 2, lines 57-59). Based on the manufacturing tool output, a tool input for a subsequent wafer is determined and fed back to the manufacturing tool for processing a second wafer (*see*, Campbell et al. at column 2, lines 59-65).

Campbell et al. does not describe or suggest testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein. Rather, Campbell et al. only teaches a process in which a manufacturing tool input, determined based on output from such tool, is fed back to the manufacturing tool for processing a subsequent wafer. Since Campbell et al. does not teach generation of both feed-forward and feedback process parameters, claims 1-3 and 9-10 are patentable thereover.

B. 35 U. S. C. § 103

1. Claims 4-5 and 11-12 are not obvious over Campbell et al. in view of Chen

Claims 4-5 and 11-12 stand rejected under 35 U. S. C. § 103(a) as being obvious over Campbell et al. (U. S. Patent 6,230,069 issued May 8, 2001) in view of Chen (U. S. Patent 5,966,312 issued October 12, 1999). The Applicants submit that these claims are not rendered obvious by the combination of these references.

Claims 4-5 and 11-12 depend either, directly, or indirectly, from claims 1 and 9, respectively, and recite limitations directed to using at least one metrology station to perform the workpiece testing step. The Examiner applied Campbell et al. to claims 4-5 and 11-12 as discussed above for claims 1 and 9. However, the Examiner concedes that Campbell et al. does not teach using at least one metrology station to perform the workpiece testing step. As such, the Examiner cites Chen for teaching the use of at least one metrology station to perform the workpiece testing step.

Chen describes a feedback system for analyzing and monitoring a manufacturing process (*see*, Chen at column 1, lines 11-15). The feedback system includes fabrication equipment 210, test equipment 212 and computer equipment 214 (*see*, Chen at FIG. 2 and column 4, lines 58-61). At several stages of manufacturing, process parameters are acquired using the test equipment (*see*, Chen at column 2, lines 64-66). These process parameters are conveyed to the computer equipment and a statistical simulation is generated using single-step feedback (*see*, Chen at column 3, lines 27-45).

Chen does not describe or suggest testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein. Rather, Chen only teaches a system in which process parameters generated from test equipment are used by computer equipment to generate a statistical simulation using single-step feedback. Since Chen does not teach generation of both feed-forward and feedback process parameters, claims 4-5 and 11-12 are patentable thereover.

Furthermore, since Campbell et al. only teaches a process in which a manufacturing tool input, determined based on output from such tool, is fed back to the manufacturing tool for processing a subsequent wafer and Chen only teaches a system in which process parameters generated from test equipment are used by computer equipment to generate a statistical simulation using single-step feedback, the combination of these references does not describ or suggest

the method recited in claims 4-5 and 11-12. In particular claims 4-5 and 11-12 recite testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein. Thus, claims 4-5 and 11-12 are patentable over the combination of these references.

2. Claims 6-7 and 13-14 are not obvious over Campbell et al. in view of Shibuya et al.

Claims 6-7 and 13-14 stand rejected under 35 U. S. C. § 103(a) as being obvious over Campbell et al. (U. S. Patent 6,230,069 issued May 8, 2001) in view of Shibuya et al. (U. S. Patent 4,411,892 issued October 25, 1983). The Applicants submit that these claims are not rendered obvious by the combination of these references.

Claims 6-7 and 13-14 depend either, directly, or indirectly, from claims 1 and 9, respectively, and recite limitations that the processing tools may include an electrochemical plating tool and a chemical mechanical polishing tool. The Examiner applied Campbell et al. to claims 6-7 and 13-14 as discussed above for claims 1 and 9. However, the Examiner concedes that Campbell et al. does not teach that the processing tools may include an electrochemical plating tool and a chemical mechanical polishing tool. As such, the Examiner cites Shibuya et al. for teaching that the processing tools may include an electrochemical plating tool and a chemical mechanical polishing tool.

Shibuya et al. describes a method of making flexible printed circuit boards (*see*, Shibuya et al. at column 1, lines 10-12). The flexible printed circuit boards include electroplated copper films (*see*, Shibuya et al. at column 5, lines 7-22).

Shibuya et al. does not describe or suggest testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpiec s therein. Rather,

Shibuya et al. only teaches a method of making flexible printed circuit boards including electroplated copper films. Thus, claims 6-7 and 13-14 are patentable thereover.

Furthermore, since Campbell et al. only teaches a process in which a manufacturing tool input, determined based on output from such tool, is fed back to the manufacturing tool for processing a subsequent wafer and Shibuya et al. only teaches a method of making flexible printed circuit boards including electroplated copper films, the combination of these references does not describe or suggest the method recited in claims 6-7 and 13-14. In particular claims 6-7 and 13-14 recite testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein. Thus, claims 6-7 and 13-14 are patentable over the combination of these references.

3. Claims 8 and 15 are not obvious over Campbell et al. in view of Satya et al.

Claims 8 and 15 stand rejected under 35 U. S. C. § 103(a) as being obvious over Campbell et al. (U. S. Patent 6,230,069 issued May 8, 2001) in view of Satya et al. (U. S. Patent 6,433,561 issued August 13, 2002). The Applicants submit that these claims are not rendered obvious by the combination of these references.

Claims 8 and 15 depend indirectly from claims 1 and 9, respectively, and recite limitations directed toward generating control parameters for the chemical mechanical polishing tool. The Examiner applied Campbell et al. to claims 8 and 15 as discussed above for claims 1 and 9. However, the Examiner concedes that Campbell et al. does not teach generating control parameters for the chemical mechanical polishing tool. As such, the Examiner cites Satya et al. for teaching the generation of control parameters for the chemical mechanical polishing tool.

Satya et al. describes a method of defect inspection and analysis for semiconductor integrated circuits (*see*, Satya et al. at column 1, lines 16-19). In one implementation, test structures are measured for chemical mechanical polish (CMP) defects and such defect data is fed back to a CMP polisher to cause the CMP process to be modified (*see*, Satya et al. at column 10, lines 39-62).

Satya et al. does not describe or suggest testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein. Rather, Satya et al. teaches a method wherein defect data is fed back to a chemical mechanical polisher (CMP) so as to modify such CMP process. Thus, claims 8 and 15 are patentable thereover.

Furthermore, since Campbell et al. only teaches a process in which a manufacturing tool input, determined based on output from such tool, is fed back to the manufacturing tool for processing a subsequent wafer and Satya et al. teaches a method wherein defect data is fed back to a chemical mechanical polisher (CMP) so as to modify such CMP process, the combination of these references does not describe or suggest the method recited in claims 8 and 15. In particular claims 8 and 15 recite testing a workpiece after one or more processing steps to generate feed-forward and feedback process parameters that are selectively provided to process tools of the manufacturing system so as to optimize processing performed upon workpieces therein. Thus, claims 8 and 15 are patentable over the combination of these references.

Conclusion

Thus, applicants submit that none of the claims, presently in the application are anticipated under the provisions of 35 U. S. C. § 102, or obvious under the provisions of 35 U. S. C. § 103. Consequently, the applicants believe that all of the claims are presently in condition for allowance. Accordingly, both

reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any claims now pending in the application, it is requested that the Examiner telephone Ms. Patricia A. Verlangieri, at (732) 530-9404, so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

5/1/03

Respectfully submitted,

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